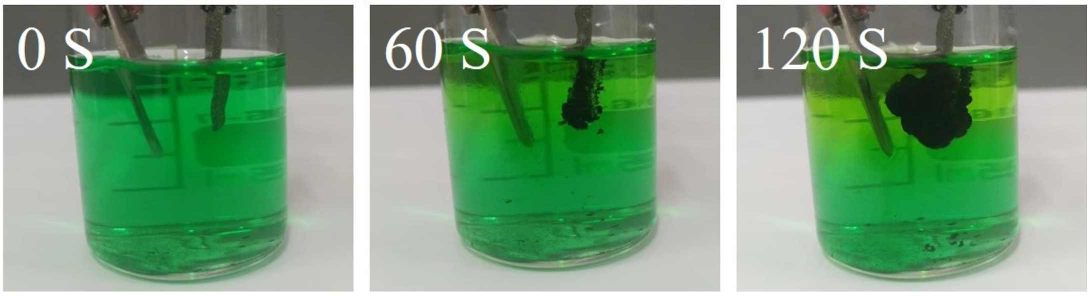

Fig S1: Photographs of the electrodeposition process.

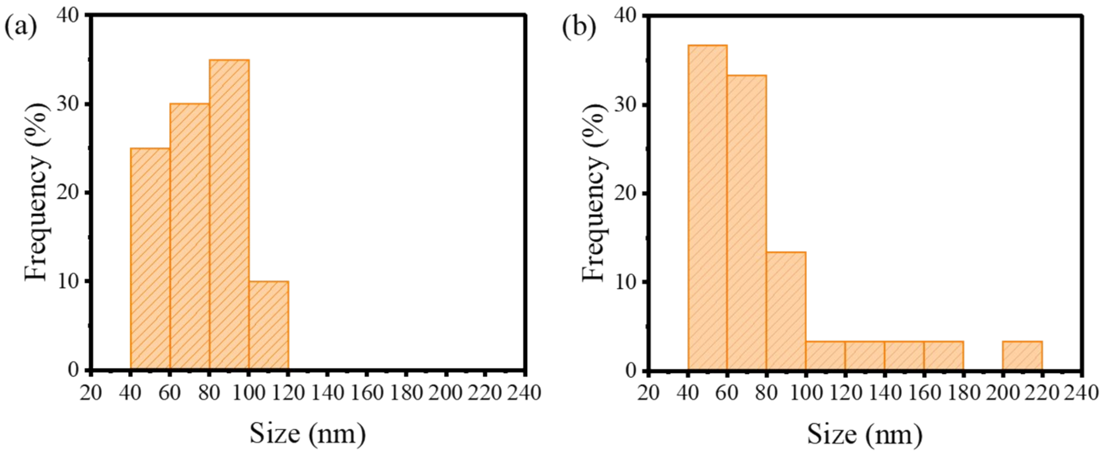

Fig S2: Size distribution histrograms of (a) EG-Ni; (b) S-Ni.

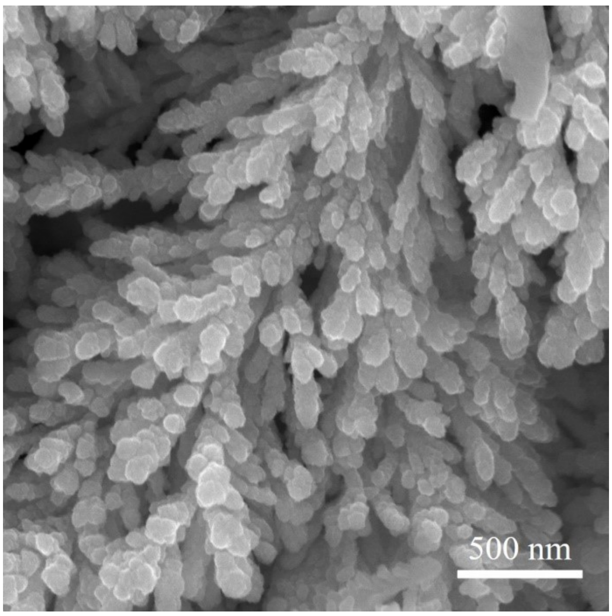

Fig S3: FESEM of A-EG-Ni.

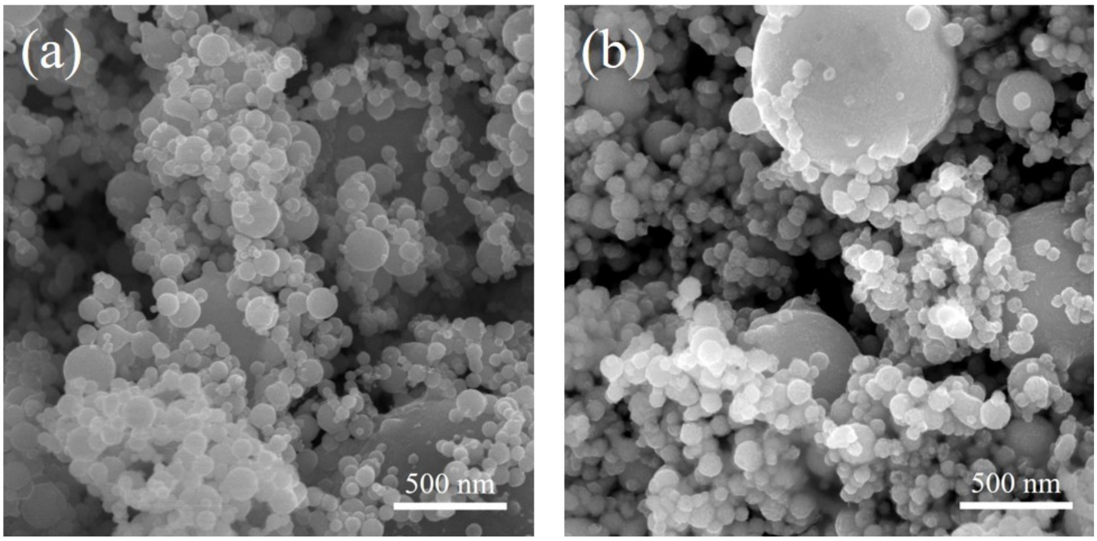

Fig S4: FESEM of (a) S-Ni and (b) A-S-Ni.

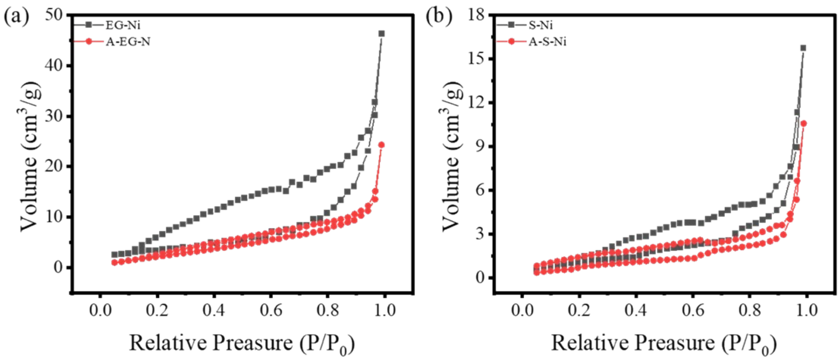

Figure S5: The N_2 adsorption/desorption isotherm curves of (a) EG-Ni and A-EG-Ni, (b) S-Ni and A-S-Ni.

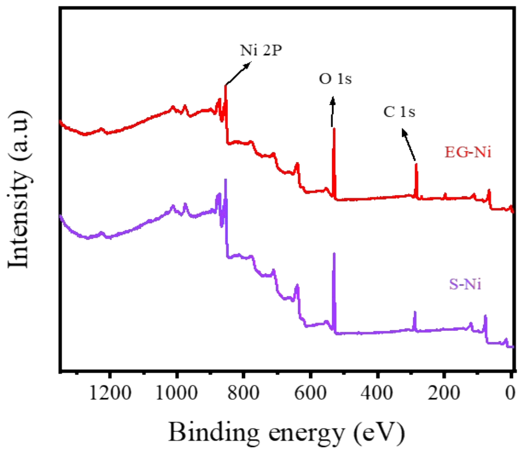

Fig S6: Full scan XPS spectra of EG-Ni and S-Ni.

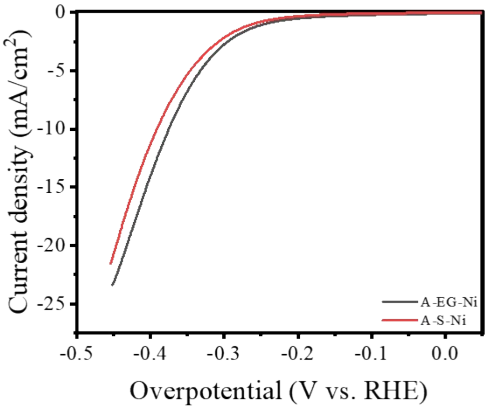

Fig S7: Linear polarization curves of A-EG-Ni and A-S-Ni.

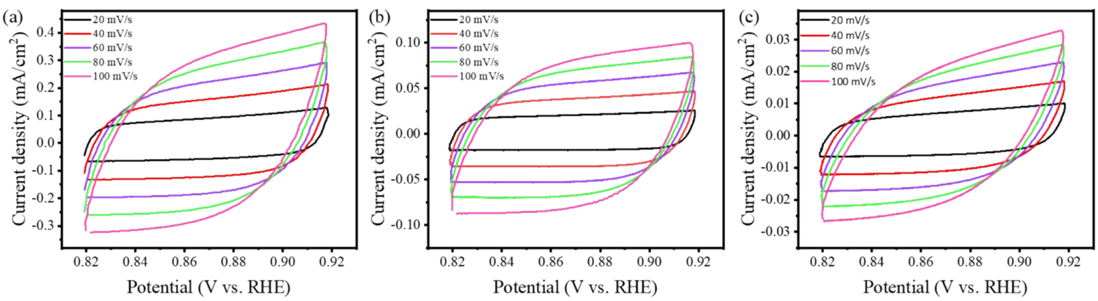

Fig S8: CV curves of (a) EG-Ni (loading x4), (b) EG-Ni and (c) S-Ni.

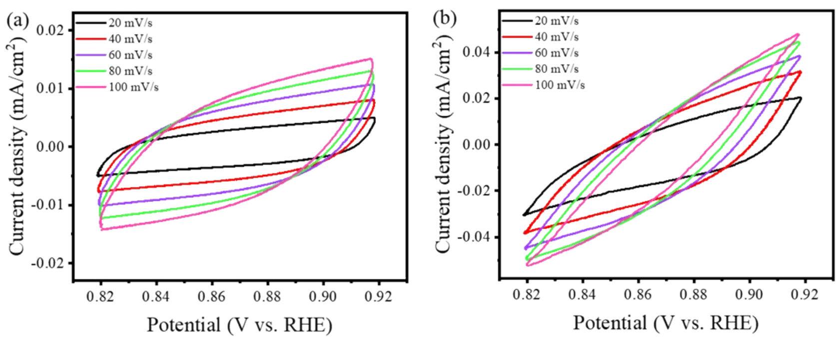

Fig S9: CV curves of (a) A-EG-Ni and (b)A-S-Ni.

Table S1: The corresponding parameters of the elements in the insert equivalent circuit of the 40% Pt/C, EG-Ni (loading x4), EG-Ni and S-Ni electrode.

Electrode	R_s (Ω)	R_p (Ω)	R_{ct} (Ω)
40% Pt/C	4.703	0.553	2.490
EG-Ni (loading x4)	4.366	1.686	1.465
EG-Ni	4.659	2.694	11.540
S-Ni	4.965	5.092	16.240

Table S2: Comparison of HER performance of EG-Ni with some Ni-based catalyst.

catalyst	Overpotential j_{10} (mV)	Tafel Slope (mV/dec)	Loading (mg/cm^2)	Electrolyte	Scan rate (mV/s)	Ref.
EG-Ni	85.9	91.4	4	1 M KOH	5	This work
NiCu@C-1	94	74	0.38	1 M KOH	10	[1]
Ni-$rGO_{1.0}$	36	77	/	1 M KOH	5	[2]
Ni-$Ni(OH)_2$	72	43	/	1 M KOH	5	[3]
MoS_2/(CoNi@Gr)	150	66	0.5	0.5 M H_2SO_4	5	[4]
np-Ni_3N	50	/	0.32	0.1 M KOH	10	[5]
Ni-$N_{0.19}$	42	125	/	1 M KOH	3	[6]
$Ni_{SA}Fe_{SA}Ni_{50}Fe$/CNT	64	48.1	2	1 M KOH	5	[7]
$Ni_3Fe_{0.9}Cr_{0.1}$/CACC	128	120	/	1 M KOH	10	[8]

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